KSAT Polar Ground Station Facilities

Svalsat and Tromsø

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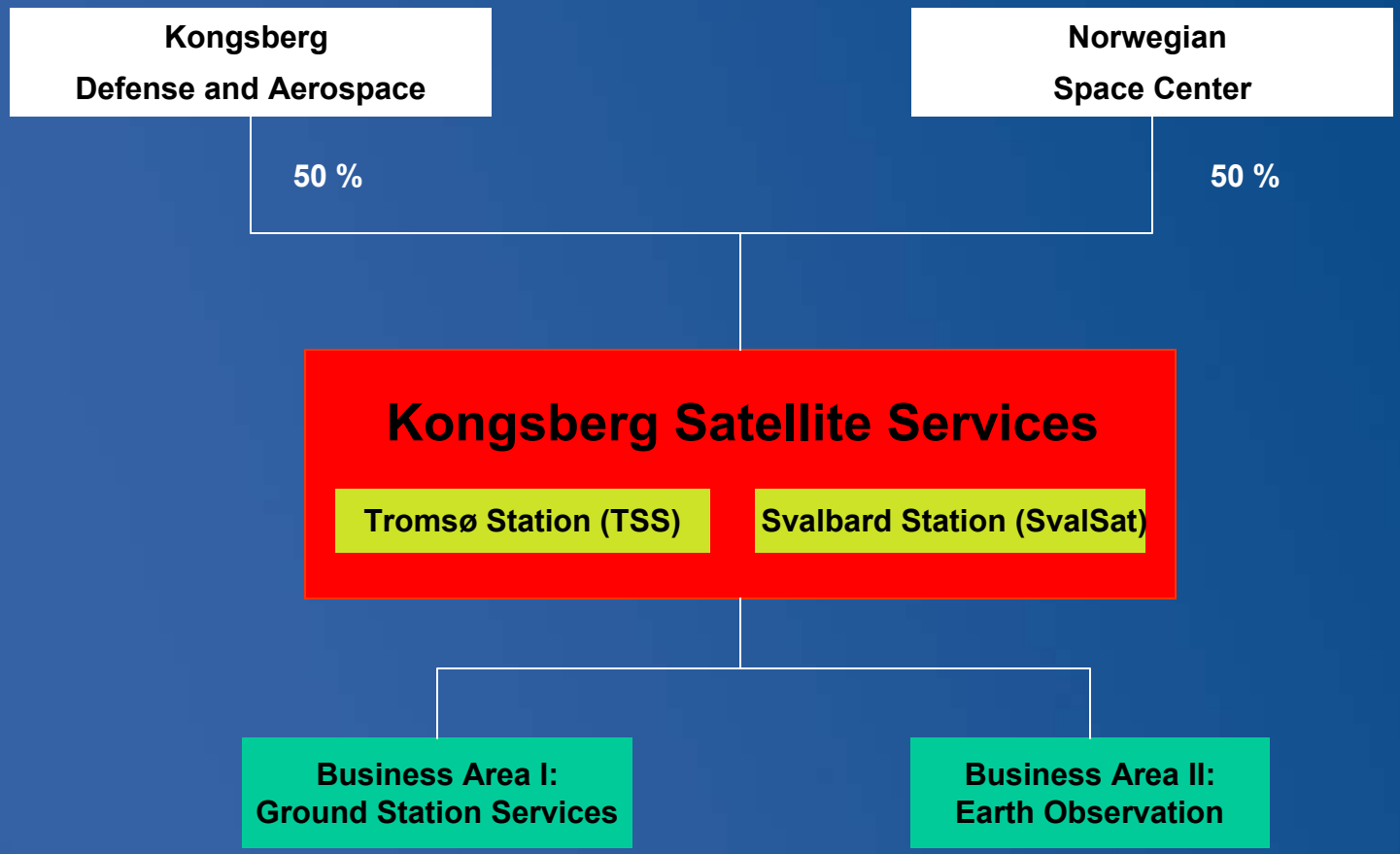

KSAT Main Activities

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- Company business areas:
  - Earth observation
  - Ground station services
- Round the clock near real-time operations
- Ground Station services
  - Routine TT&C and data acquisition, LEOP support
  - Operations of Svalbard station
- Earth observation
  - focus on SAR missions (ERS-2, Radarsat, Envisat, ...) - supported by optical data
  - Provision of information services, e.g. Detection of oil spills
  - Image data processing and distribution

Where we are located

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Svalsat site

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- At Svalbard island (78 deg north)
- Currently 6 large S +X antennas
- Ground Station Services

Tromsø site

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- Norway mainland (69 deg north)
- 3 large S +X antennas
- KSAT headquarter
- EO services

Tromsø & Svalbard Antenna Configuration and Users

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Tromsø Station

Svalsat Station

Earth Observation

Meteorology

Digital G. | TG1 | TG2 | SG1 | SG2 | SG3 | SG4 | EUM-1 | EUM-2

Tromsø Network Operations Center
(Scheduling, backup, conflict resolution)

Digital Globe | TBD | NASA | ESA/ESOC | ESA/ESRIN | IPO, NOAA | EUMETSAT

Activities
Tromsø Station

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- Increasing demand for operational services
  - Regional and global european needs for maritime surveilleance
  - Themes: Oil/gas exploitation, fisheries, environment, security
- Near Realtime Services
  - Images processed within 10 minutes after LOS.
  - Information (e.g. Oil spill warning) distributed within 60 minutes
- SAR Processing Applications
  - Oil pollution Monitoring and ship detection
  - Sea Ice Monitoring. US National Ice Center, Canada, Greenland, Baltic Sea
  - Wind information from scattereometers and SAR
- Radar Xband Missions
  - ERS-2, Radarsat-1, Envisat, Radarsat-2, Alos, Cosmos Skymed, TerraSAR

Svalsat Services and Systems

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- Commanding & Control of satellites in polar orbits
  - Routine TT&C
  - Routine data reception (S -X band) and distribution
  - LEOP Support
  - Back-up and anomaly support
- Main systems
  - SG1 (NASA 11m system)
  - SG2 (KSAT 11 meter system supporting NASA)
  - SG3 (KSAT 13 meter system supporting ESA and NASA)
  - SG4 (IPO 13 meter system to be installed fall 2003)
  - CDA1/CDA2 (Eumetsat EPS systems)
  - Communication
- Remote operations from Tromsø Network Control Centre (TNOC)

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Ground station service concept

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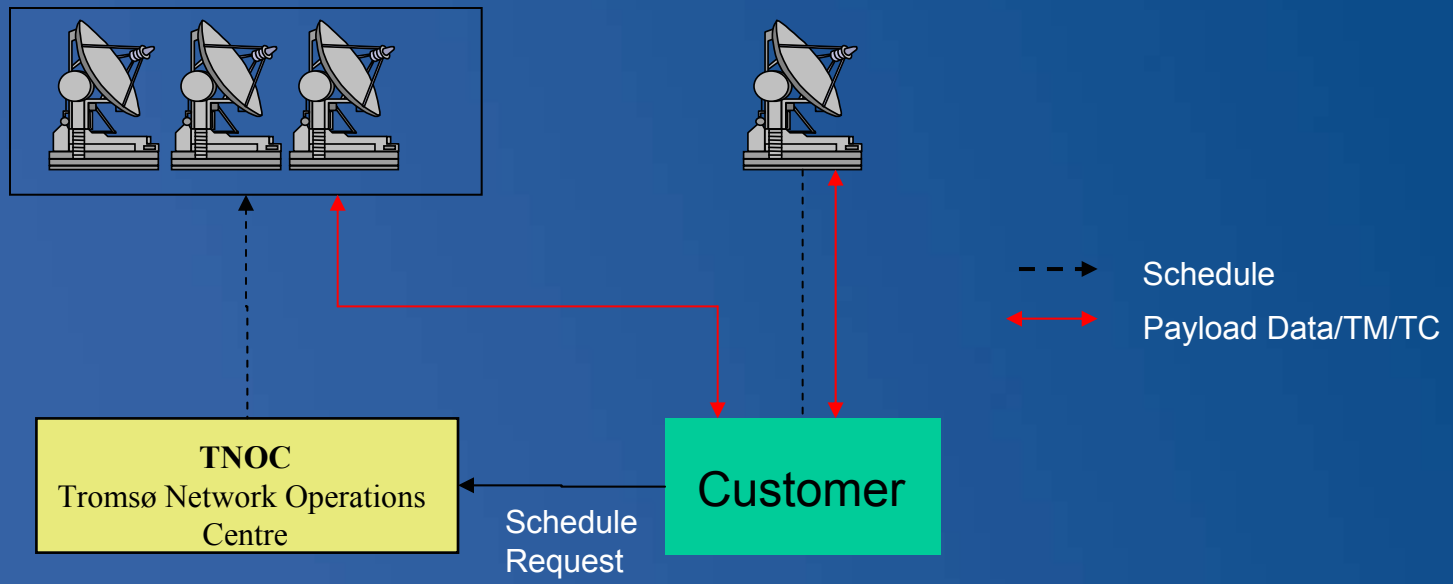
- TT&C support provided both through KSAT infrastructure and customer specific equipment.
- TM/TC/Payload data routed directly from the Ground Station to the project



Svalsat – Missions Supported

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- Current Missions:
  - EOS Missions:
    Aqua, Terra, Icesat, Aura (2004)
  - Other NASA Missions
    Landsat-7 , EO-1, QuikSCAT, Champ
  - ESA Missions:
    Envisat, ERS-2
  - Other Missions:
    SAC-C, Radarsat, Noaa, Grace-1, Grace-2, Gravity Probe B, Acrimsat
- Upcoming Missions
  - NPP, NPOESS
  - Solar-B
  - Metop

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Svalsat – Xband Acquisition Capabilities

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- 11m and 13m systems
- G/T: ~36 db/K
- Full range (7500-8400 Mhz), multiple (three - four) channels.
- 300 mbit acquisitions. RAID based data storage
- Real-time CCSDS processing

Xband downlinks Svalsat (2003)

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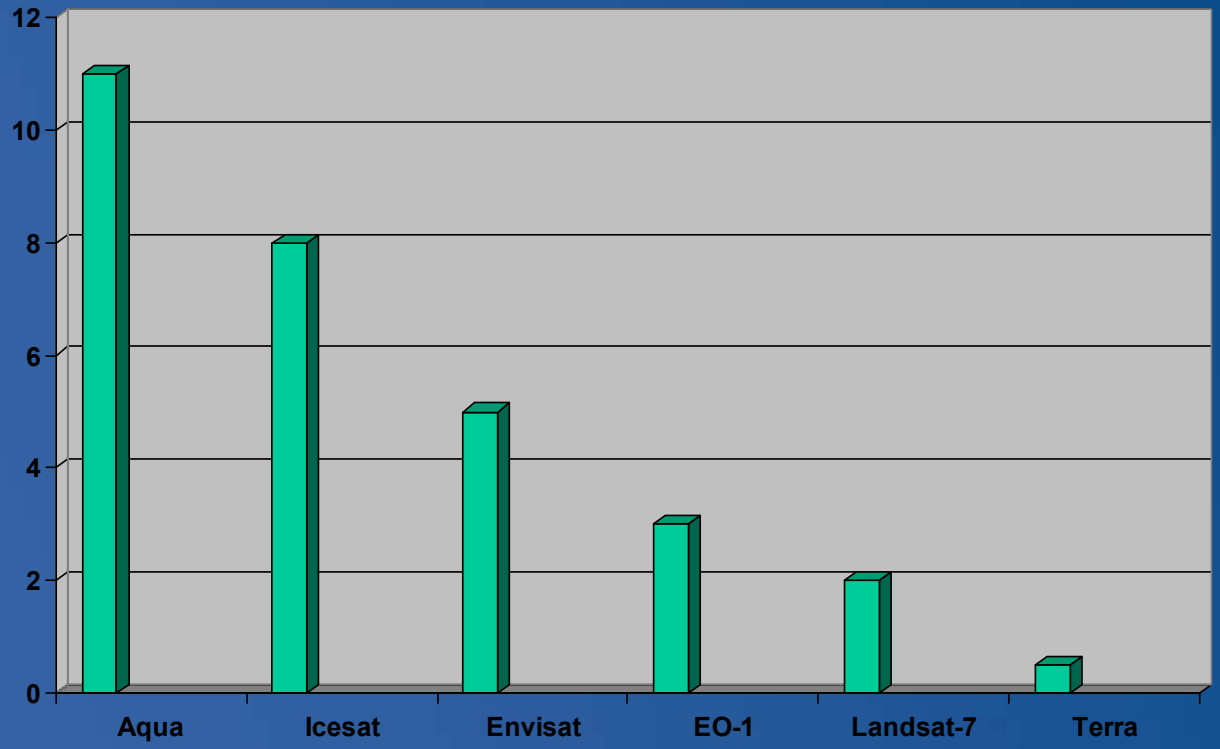

- Approximately 30 Xband passes captured every day

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Xband downlinks Svalsat estimated in 2006/2007

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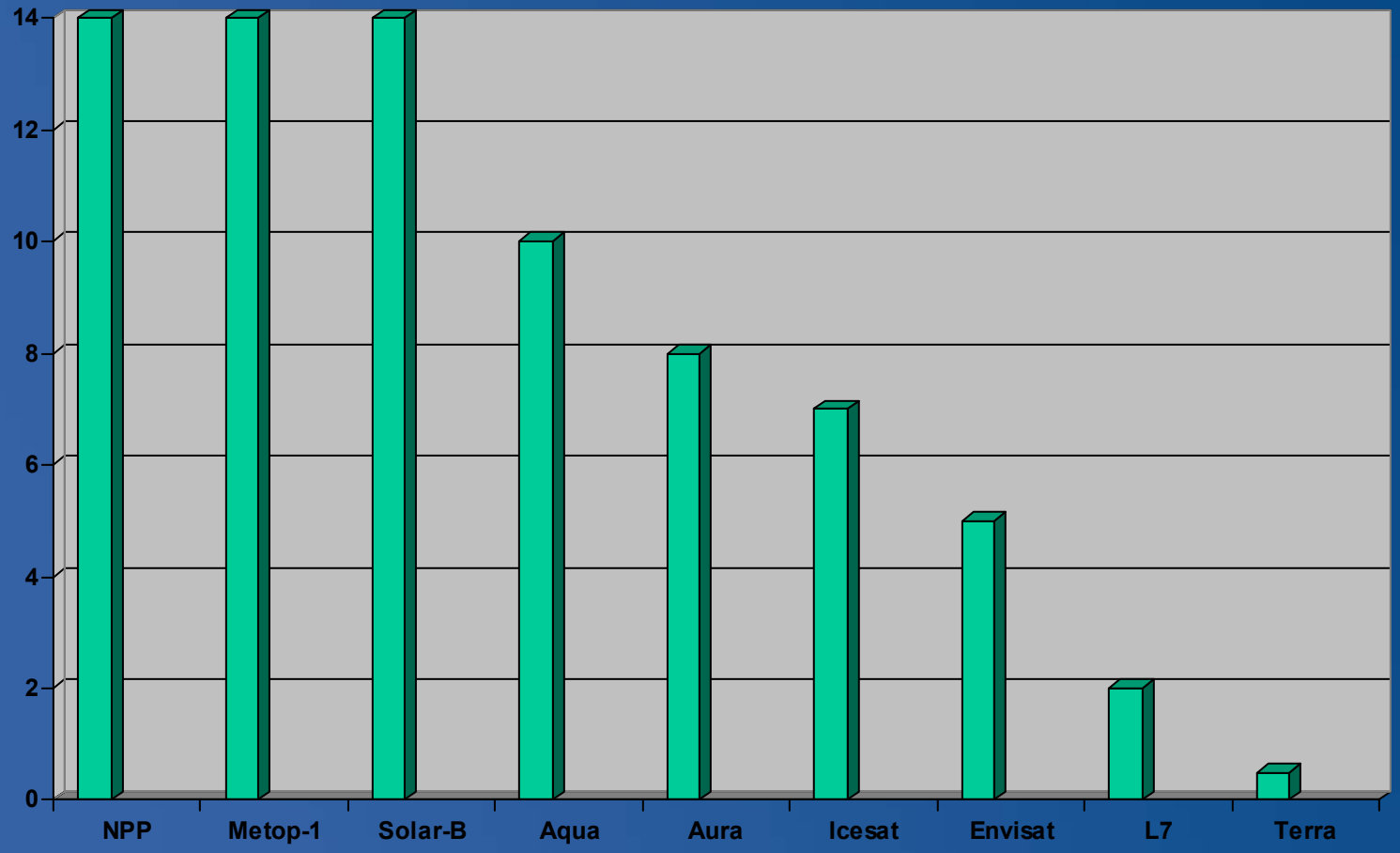

Other potential missions with Xband downlink at Svalsat

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Ongoing discussions with:

- TerraSAR
- Cosmos-Skymed
- Pleiades
- Cryosat
- Rapideye

Xband Downlinks - Tromsø

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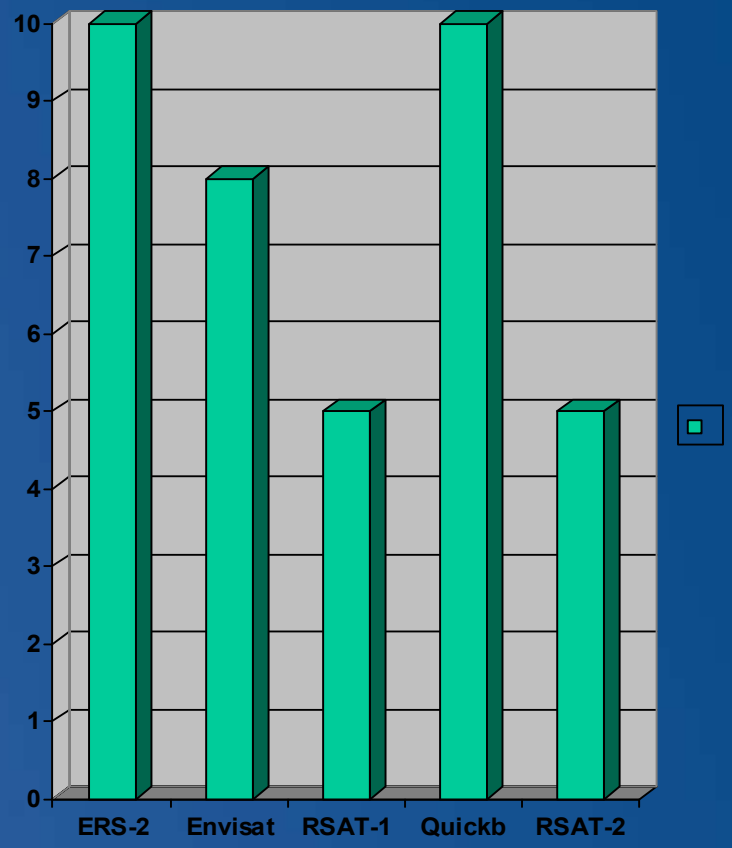
- Approximately 35 Xband passes currently captured every day
- Radarsat II agreement closed with Canada.



High Bandwidth Communication

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- Current Communication
  - satellite based
  - capacity vs. costs concern

- Fiber Project
  - Connecting Svalsat to the terrestrial fiber network in Europe via a redundant cable between Svalbard and Norway mainland.
  - Provides Gbit bandwidth access to the Svalsat users
  - Implementation planned for 2003/2004.

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KSAT Acquisiton Network

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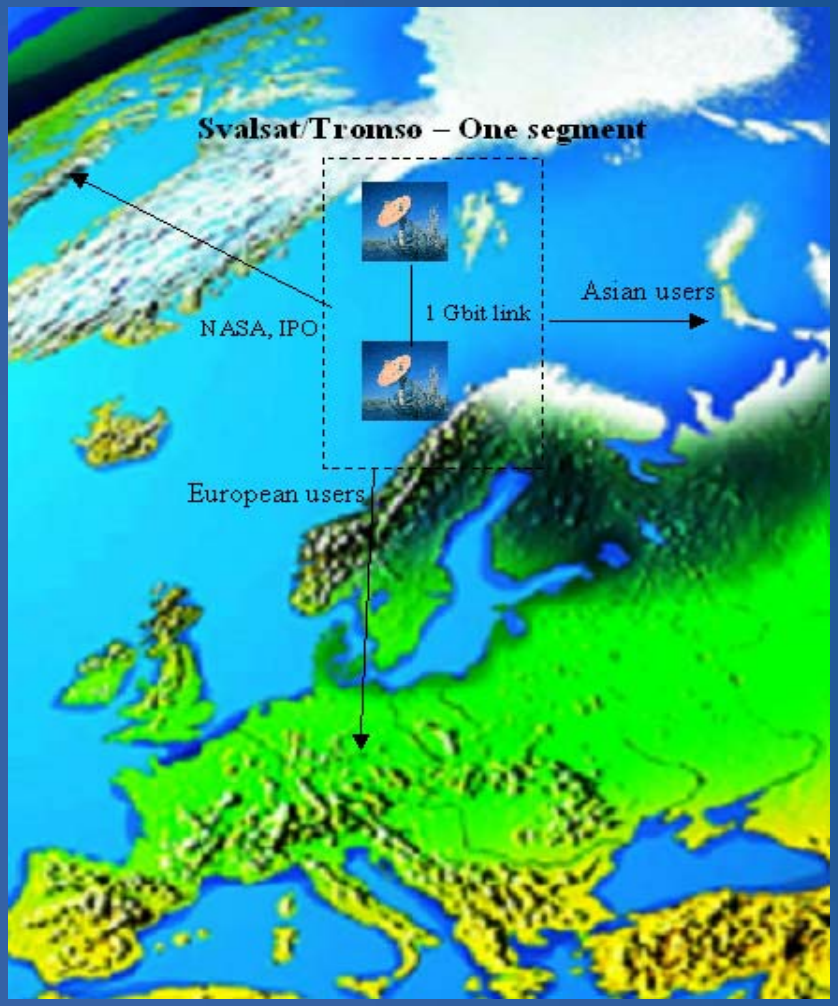

- Dual site acquisiton
- High bandwidth comunication integrates Svalsat and Tromsø.
- Supports will be diverted to the alternative site in case of conflicts

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